SECTION 3 - AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION MEASURES

3.1 PROPOSED ACTION

This section evaluates the impacts of the Proposed Action on specific environmental factors. The format for the discussion of each environmental factor includes a detailed description of the affected environment or characteristics of the surrounding area and the Project site, the environmental consequences, also called environmental effects or impacts of the Project, and the mitigation measures that will be part of the Project development. The affected environment discussion is also applicable to the analysis of alternatives contained in Section 3.2, but is not repeated.

The following matrix summarizes potential impacts to the "critical elements of the human environment" (BLM Manual H-1790-1, Appendix 5, as amended) which are elements of the human environment which must be addressed in all BLM environmental analyses. Affected elements will be discussed in further detail in the section noted in the far right-hand column. Discussions of certain elements were included in the document, were determined to have no impact, and are so noted. Elements for which there are no issues related to the Proposed Action or alternatives will not be discussed further.

3.1.1 Geotechnical

This section considers geotechnical aspects of TMC's proposed sand and gravel mining operation in Soledad Canyon including the geology, soils, mineral resources, and geologic hazard concerns both onsite and in the surrounding area. It summarizes and incorporates information from geologic studies of the Project site completed by Soil and Testing Engineers, Inc. (STE) and Hilltop Geotechnical (Hilltop) (STE 1990a, 1990b, 1991; Hilltop 1992, 1993a, 1993b, 1995a, 1995b, 1996, 1997a, 1997b, 1997c). Those studies involved a review of relevant geologic literature and surface reconnaissance of the site to map and describe the general geology (including the lithology, structure, soils, and seismicity), determination of the usable aggregate resources onsite, and slope stability evaluations.

3.1.1.1 Affected Environment

Surrounding Area

Geology

The Project site is located on the south margin of the Soledad Basin, which is situated near the central part of the Transverse Range Province of California. The Soledad Basin is considered

POTENTIAL IMPACTS TO CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT BY ALTERNATIVE

Critical Element of the Human Environment (Relevant Authority)	Alternative								
	Proposed Action	No Action	Reduced North Fines Storage Area	Batch Plant Location	Reclaimed Water	Railroad Transportation	Alternative North Fines Storage Area	Reduced Quantity Mining Concept	EIS Section
Air Quality (The Clean Air Act as amended (42 USC 7401 et seq.))	NO_x, ROG, and PM-10 emissions remain significant.	No impact.	Reduced emissions from less onsite activity remains significant.	Slightly fewer emissions, remains significant.	Increased, if water is trucked in, remains significant.	Increased emissions from train transport, remains significant.	Slightly increased emissions, rmains significant.	Fewer emissions over long term, NO_x, PM-10, and ROG remain significant.	3.1.7
Areas of Critical Environmental Concern (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.))	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	Not Applicable.
Cultural Resources (National Historic Preservation Act as amended (16 USC 470))	Historic site will be avoided.	No impact.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	3.1.9
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1966))	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	Not Applicable.
Farm Lands (prime or unique) (Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.)	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	3.1.12
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	Potential impacts from increased runoff reduced to non-significant.	Potential significant impacts from no silting/debris basin controls.	Slightly less than Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Greater runoff potential, impacts reduced to non-significant.	3.1.2, 3.2
Minerals (Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.)	No impacts.	All resources would remain in place.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.	Some resources would remain in place.	3.2

POTENTIAL IMPACTS TO CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT BY ALTERNATIVE (CONTINUED)

Critical Element of the Human Environment (Relevant Authority)	Alternative								
	Proposed Action	No Action	Reduced North Fines Storage Area	Batch Plant Location	Reclaimed Water	Railroad Transportation	Alternative North Fines Storage Area	Reduced Quantity Mining Concept	EIS Section
Threatened or Endangered Animal Species **(Endangered Species Act of 1973 as amended (16 USC 1531))**	Potential impacts to unarmored threespine stickleback reduced to non-significant.	Potential impacts to stickleback habitat.	Same as Proposed Action.	Similar impact to Proposed Action.	No impact.	Same as Proposed Action.	Same as Proposed Action plus potential impact to slender-horned spineflower.	Same as Proposed Action.	3.1.8, 3.2
Threatened or Endangered Plant Species **(Endangered Species Act of 1973 as amended (16 USC 1531))** **Wetlands/Riparian Zones** **(E.O. 11990, Protection of Wetlands, 5/24/77)**	Loss of natural vegetation and sensitive species reduced to non-significant.	Potential impacts to stickleback habitat.	Slightly less acreage than Proposed Action affected.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Slightly larger area then Proposed than Proposed Action affected.	Less acreage than Proposed Action affected.	3.1.8, 3.2
Wastes (hazardous/solid) **(Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.), Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended (42 USC 9615))**	Onsite materials not significant.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	3.1.1, 3.2
Water Quality (drinking/ground) **Clean Water Act of 1977 (33 USC 1251 et seq.))**	Potential impacts from increased sedimentation, debris flows, and operational contaminants reduced to non-significant.	No erosion or sedimentation control would result in potentially significant impact.	Same as Proposed Action.	Same as Proposed Action - slight reduction in water demand.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	Same as Proposed Action.	3.1.4, 3.2

POTENTIAL IMPACTS TO CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT BY ALTERNATIVE (CONTINUED)

Critical Element of the Human Environment (Relevant Authority)	Alternative								
	Proposed Action	No Action	Reduced North Fines Storage Area	Batch Plant Location	Reclaimed Water	Railroad Transportation	Alternative North Fines Storage Area	Reduced Quantity Mining Concept	EIS Section
Wild and Scenic Rivers (Wild and Scenic Rivers Act as amended (16 USC 1271))	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	Not Applicable.
Wilderness Areas (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.) Wilderness Act of 1964 (16 USC 1131 et seq.))	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	No issues.	Not Applicable.
Environmental Justice (E.O. 12898, 2/11/94)	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	3.1.19
Environmental Health and Safety Risks to Children (E.O. 13045, 4/21/97)	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	No impact.	3.1.19

to be a terrestrial rift basin that formed between the San Gabriel and San Andreas Faults. It is believed to be filled with over 15,000 feet of Oligocene through Recent nonmarine sedimentary and volcanic materials. Deposits in Soledad Basin are thought to have mainly originated from the San Gabriel Mountains to the south and east, and Pelona Ridge to the north. Prominent faults in the immediate vicinity of the Project site are the Agua Dulce Fault to the north and the Soledad Fault to the south and east. Figure 3.1.1-1 shows the geology of the general area of the Project site.

The Mint Canyon Formation, covering approximately 45 square miles, is the most widely distributed rock formation in the Soledad Basin. It consists of several thousand feet of upper Miocene nonmarine sedimentary rocks and unconformably overlies conglomerates of the Oligo-Miocene Vasquez Formation. In the area north of the Soledad Fault, including the Project site, beds of upper Vasquez Formation conglomerate occur on the surface and dip 25 to 35 degrees to the northwest. In addition to upper Vasquez Formation conglomerates, sedimentary materials in Soledad Basin include river and alluvial terrace deposits (thought to be Pleistocene to Recent in age) and Recent alluvium and colluvium.

In several localities, especially northeast of the site and north of the Agua Dulce Fault, the Vasquez Formation displays erosion of thick, well-cemented, resilient beds of sandstone and has developed distinctive, spectacular outcrops. Coarse sandstone and conglomerate beds, dipping due west at angles of 20 to 40 degrees, form continuous great outcrops in the area just north of the Soledad and Pole Canyon Faults, 2 to 4 miles east of Agua Dulce Canyon.

Soils

Soils in the site vicinity are shown on Figure 3.1.1-2. Soil maps prepared by the U.S. Department of Agriculture (USDA) for the area do not include the National Forest land south and southeast of the site. Northwest of the site, the 2- to 9-percent sloped alluvial fan draining into Bee Canyon is covered by Cortina cobbly sand loam. The Cortina series consists of excessively drained soils that formed in alluvium from predominantly sedimentary sources. Permeability is rapid, and the available water-holding capacity is 2 to 3 inches. Runoff is slow, and the hazard of erosion is slight. Fertility is low. Roots can penetrate to a depth of 60 inches or more.

Cortina series soils extend to Riverwash southwest of Soledad Canyon Road. Riverwash material extends upstream along the Santa Clara River to at least the former gaging station, where it meets sandy alluvial land. Riverwash occurs as narrow stringers of gravelly sand in the beds of intermittent streams. The hazard of soil blowing for the unit is slight to moderate.

Amargosa rocky coarse sandy loam occurs in the area east of the Project site on the south bank of the Santa Clara River. Cortina cobbly sand loam occurs in small ravines north of the river. Southeast of the site is an area of Metz loamy sand on an alluvial fan along the Santa Clara River. Metz series soils are somewhat excessively drained and occur in areas of 2- to 5-percent slope. Permeability is rapid, and available water-holding capacity is 4 to 5 inches. Fertility is low. Runoff is slow, and the hazard of erosion is slight.

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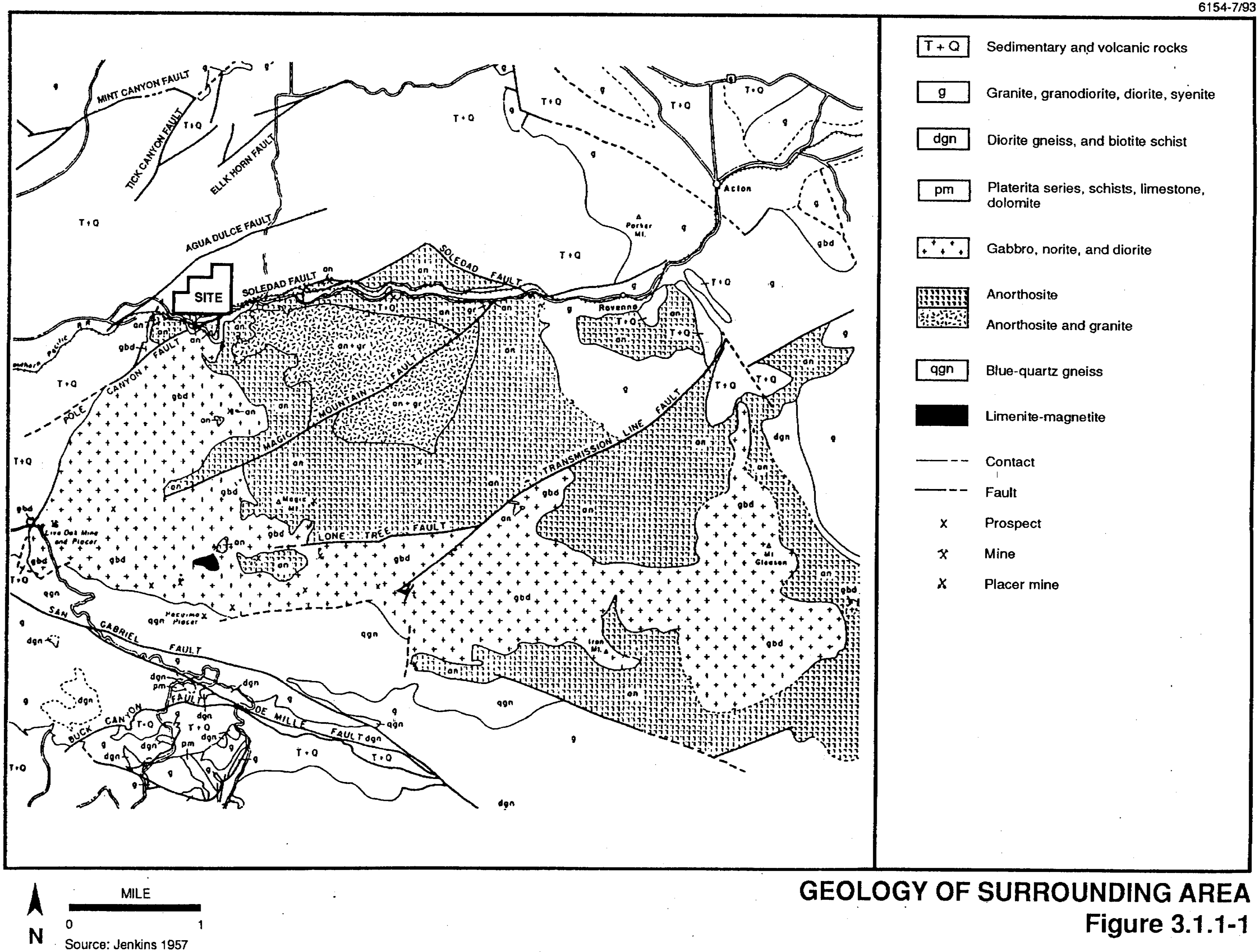

Source: Jenkins 1957

GEOLOGY OF SURROUNDING AREA
Figure 3.1.1-1

AgF	Agua Dulce stony loam, 30 to 50 percent slopes
AmF2	Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded
CkC	Castaic silty clay loam, 2 to 9 percent slopes
CnG3	Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded
CyA	Cortina sandy loam, 0 to 2 percent slopes
CyC	Cortina sandy loam, 2 to 9 percent slopes
CzC	Cortina cobbly sandy loam, 2 to 9 percent slopes
HcC	Hanford sandy loam, 2 to 9 percent slopes
MfC	Metz loamy sand, 2 to 9 percent slopes
MhE2	Millsholm rocky loam, 15 to 30 percent slopes, eroded
MhF2	Millsholm rocky loam, 30 to 50 percent slopes, eroded
ObC	Oak Glen sandy loam, 2 to 9 percent slopes
OcC	Oak Glen gravelly sandy loam, 2 to 9 percent slopes
OgC	Ojai loam, 2 to 9 percent slopes
OhF	Ojai loam, thin surface variant, 30 to 50 percent slopes
Rg	Riverwash
Sa	Sandy alluvial land
ScF2	Saugus loam, 30 to 50 percent slopes, eroded

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Source: United States Department of Agriculture, 1970

SOILS MAP OF THE PROJECT SITE AND SURROUNDING AREA

Figure 3.1.1-2

Mineral Resources

Oil and Gas

The California Division of Oil and Gas (CADOG) Regional Wildcat Map W1-2 "Los Angeles," revised June 19, 1986, indicates that the only recorded oil/gas well in the vicinity of the site is approximately 5.75 miles due west. The well is located in the Southeast half of the South half of Township 4N, Range 14W, Section 7 of the San Bernardino Base and Meridian (SBBM). It was drilled in 1967 by Dunhill Petroleum Co. to a total depth of 1,208 feet below ground surface (bgs) and closed as a dry hole. No other oil/gas wells have been recorded in this township.

Aggregates

Soledad Canyon and Lang Station to the west of the site contain numerous surface mining operations. These operations are described in Section 3.1.12 under Adjacent Land Use. These mining sites are situated in an MRZ-2 zone as designated in the Saugus-Newhall P-C Region (CDMG 1987b; Plate 5.1).

The Palmdale P-C Region lies predominantly east and northeast of the Saugus-Newhall P-C Region. Aggregate resources in the Palmdale P-C Region, which is approximately 35 miles away from the Project site, are not considered to be a viable source of materials for users in the Saugus-Newhall P-C Region because of hauling costs (CDMG 1987b).

Other Mineral Resources

Rock materials on the property south of the Project site are principally Precambrian anorthosite with some gabbro, norite, and diorite. Previously, mining occurred on this property for rock to be used as riprap.

Starting in the late 1920s, mining of a massive titanium mineral deposit occurred 2.4 miles southeast of Lang (Jenkins 1957). Ilmenite ($FeTiO_3$) is a principal ore mineral of titanium. Mining for ilmenite from mineral sands also occurred in the 1940s on the Live Oak and Ferro-Titan properties in Lower Sand Canyon in the San Gabriel Mountains. The CDMG has also identified an ilmenite deposit associated with an anorthosite/norite complex approximately 4.15 miles south of the site, past Magic Mountain (Jenkins 1957).

Seismicity

The Project site is located approximately 12.4 miles southwest of the San Andreas fault zone and north of the Sierra Madre and San Gabriel fault zones. These zones are considered to be seismically active (i.e., active faults are those with surface displacement within the past 11,000 years) and have shown evidence of historic activity. Based on seismic activity and recurrence data for the closest known active faults, it may be assumed that the San Andreas Fault represents the greatest potential for seismic hazards within the site vicinity over the next 50 years.

Three faults in the Project vicinity are considered inactive: the Agua Dulce, Soledad, and Pole Canyon Faults. Movement along the Soledad Fault located south of the Project site ceased over 12 million years ago. The Pole Canyon Fault crosses the Santa Clara River, approximately 500 feet south of the Old Lang Gaging Station (Ground Water Systems, Inc. [GWSI] 1993), and is evident in a road cut along Soledad Canyon Road south of the proposed sand and gravel extraction operation Area A. Further east along the fault, it crosses the Santa Clara River again through Area B. To the north of the site is the east-west trending Aqua Dulce Fault.

Project Site Characteristics

Geology

The site is characterized by a northeast-southwest-trending ridge that is cut by steep-sided canyons. Elevations onsite range from a low near the southwest corner of approximately 1,875 feet above mean sea level (elevation) to a high peak near the center of the site that is at the 2,745-foot elevation.

Northwesterly dipping conglomeratic material of the upper Vasquez Formation constitutes the primary lithologic unit on the Project site. The site is bounded on the north by the Agua Dulce Fault and on the south by the Soledad Fault, except for the southeast corner of the site, which extends south of the Soledad Fault. South of the Soledad Fault, the lithology changes to Precambrian anorthosite and Mesozoic monzonite, which are both intrusive igneous rock types. Anorthosite is a dark colored rock comprised of minerals rich in iron and magnesium; monzonite is light colored and contains primarily quartz, feldspars, and some mafic minerals.

The thick conglomerate upper Vasquez Formation is the principal rock unit of interest on the Project site. For mapping and rock quality purposes, the upper Vasquez Formation conglomerates onsite have been separated into a lower unit, Unit 1 (Tv1); a middle unit, Unit 2 (Tv2); and an upper unit, Unit 3 (Tv3).

Tv1 appears to contain the best-quality material for use as aggregate. The strata of this unit appear to have been deposited as a large alluvial fan, consisting of mainly clast-supported, anorthosite-rich fanglomerate that was sourced from the flank of the San Gabriel Mountains. The fan appears to have migrated back and forth in an east-west direction during its time of deposition. Rocks that were deposited on the main portion of the fan tend to be coarser grained, exhibit layered bedding, and have a cleaner matrix. Those deposited on the flank areas of the fan tend to have smaller clasts, exhibit channeling and crossbedding, and have a silty to very silty matrix.

The strata Tv2 appear to have been deposited on the distal end of a large alluvial fan. This unit is composed of interfingering grayish beds of Unit 1 lithology and gray-brown to reddish-brown beds of Unit 3 lithology. Unit 2 seems to represent a transition zone between the Unit 1 fanglomerates and the Unit 3 alluvial gravels and distal fan deposits.

Strata of Tv3 appear to have been deposited mainly as alluvial river deposits. The clasts tend to be smaller, more rounded, and of more diverse composition than those found in Unit 1. There also seems to be about 15 percent more dark mafic clasts than seen in Unit 1. Most of these dark mafic clasts are highly weathered. Where exposed, the conglomerates of this unit appear to be about half clast-supported and half matrix-supported. The matrix is quite silty and is commonly oxidized to a reddish-brown color.

Soils

The USDA (1970) has identified the predominant soil unit on the Project site as Amargosa rocky coarse loam. This unit typically occurs on slopes from 9 to 55 percent where approximately 25 to 40 percent of the original surface soil has been removed through moderate sheet and rill erosion. Rock outcrops cover 2 to 10 percent of the surface, and many areas are cut by shallow gullies. Permeability is moderately rapid, and available water-holding capacity is 1.0 to 1.5 inches. Fertility is very low, runoff is medium to rapid, and the hazard of water erosion is moderate to high. In most places, roots can penetrate to a depth of 14 to 20 inches.

The southern part of the northeast- to southwest-trending ridge across the Project site is covered by Castaic and Saugus soils that have been severely eroded. The Castaic/Saugus unit is composed of 35 percent Castaic silty clay loam and 30 percent Saugus loam. Included in this mapping unit are exposed areas of soft shale and conglomerate, which make up as much as 10 percent of the unit, and areas of Balcom silty clay loam comprising as much as 25 percent. Areas with this soil unit are cut by many intermittent, very deep drainage channels with narrow, V-shaped valleys and sharp, tortuous divides. Soil slippage is common, and geologic erosion is active. During heavy rainstorms, large amounts of silt are washed from these soils. Available water-holding capacity is 4.0 to 6.0 inches for Castaic soils and 4.0 to 7.0 inches for Saugus soils. In both soils, fertility is very low, runoff is very rapid, and the hazard of erosion is very high.

In the central and northwest areas of the site, Ojai loam occurs on the prominent ridge and slopes draining toward Bee Canyon. Ojai soils are well drained and formed in uplifted, loose, sedimentary alluvium comprised of rounded granite, basalt, and schist pebbles and cobbles. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is high. Available water-holding capacity is 8.0 to 11.0 inches, and fertility is low.

The soil unit along the Santa Clara River is mapped as sandy alluvial land (Sa). This unit consists of unconsolidated alluvium that is generally stratified and ranges from sand to loamy sand in texture.

Mineral Resources

Oil and Gas

The CADOG Regional Wildcat Map W1-2 "Los Angeles," revised June 19, 1986, indicates that no oil/gas wells have been drilled on the Project site.

Aggregates

Mineral rights at the Project site are controlled by the BLM. On August 18, 1989, the BLM advertised a Notice of Sand and Gravel Sale to be held by a public competitive bid. The sale was conducted in accordance with the ordered stipulation for compromise settlement by the United States District Court for the Central District of California and applicable laws and regulations. Sealed bids were opened at a public bid opening on September 15, 1989, at the BLM California Desert District, Palm Springs, California. As a result of a successful bid, TMC obtained Federal Contracts for mining sand and gravel.

The CDMG has classified the Project area as an MRZ-2 zone (see Figure 2.3-2), indicating that deposits can be mined and profitably marketed for use as PCC-grade aggregate. The site was designated by the SMGB as a Regionally Significant Construction Aggregate Resource Area, Sector B-2, in accordance with the SMARA of 1975 (CDMG 1987b). Figure 3.1.1-3 shows the designated aggregate resource sectors. The site is situated in the Saugus-Newhall P-C Region, which includes the upper Santa Clara River and a large area of the hills to the north, a total of 651 square miles.

Other Mineral Resources

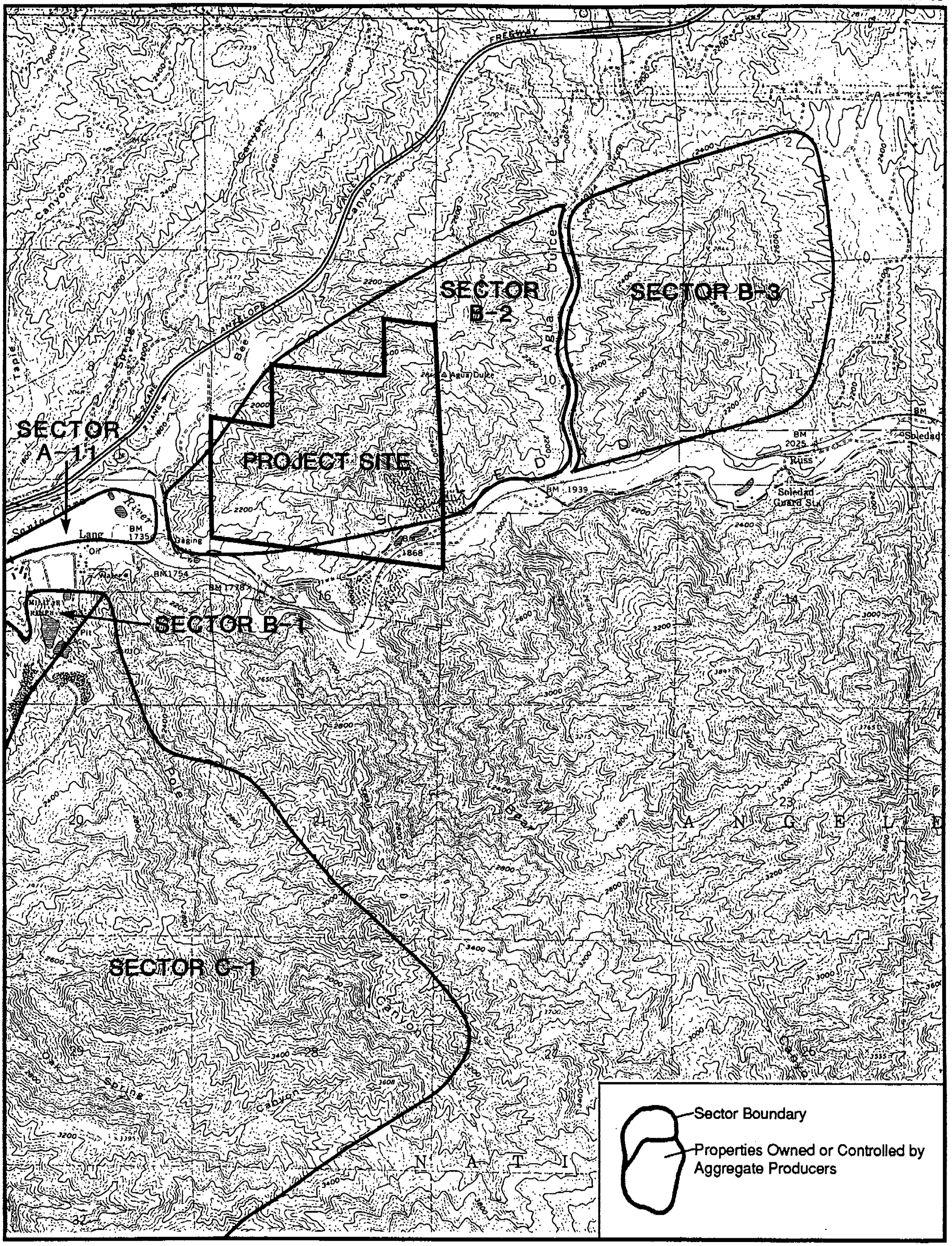
Some other geologic minerals, including gold, may be present in trace amounts at the site and are incidental to the proposed sand, gravel, and aggregate operation. TMC's Mining Plan does not provide for recovery and processing of such minerals nor do the Federal Contracts provide for such recovery and processing. No other mineral resources of significance occur onsite.

Seismicity

A potentially active fault is defined by the Alquist-Priolo Act as showing evidence of surface displacement during Quaternary time (last 1.6 million years). An active fault is defined as showing evidence of surface rupture during Recent time (last 11,000 years). The term "inactive" is applied to faults that are not considered active or potentially active.

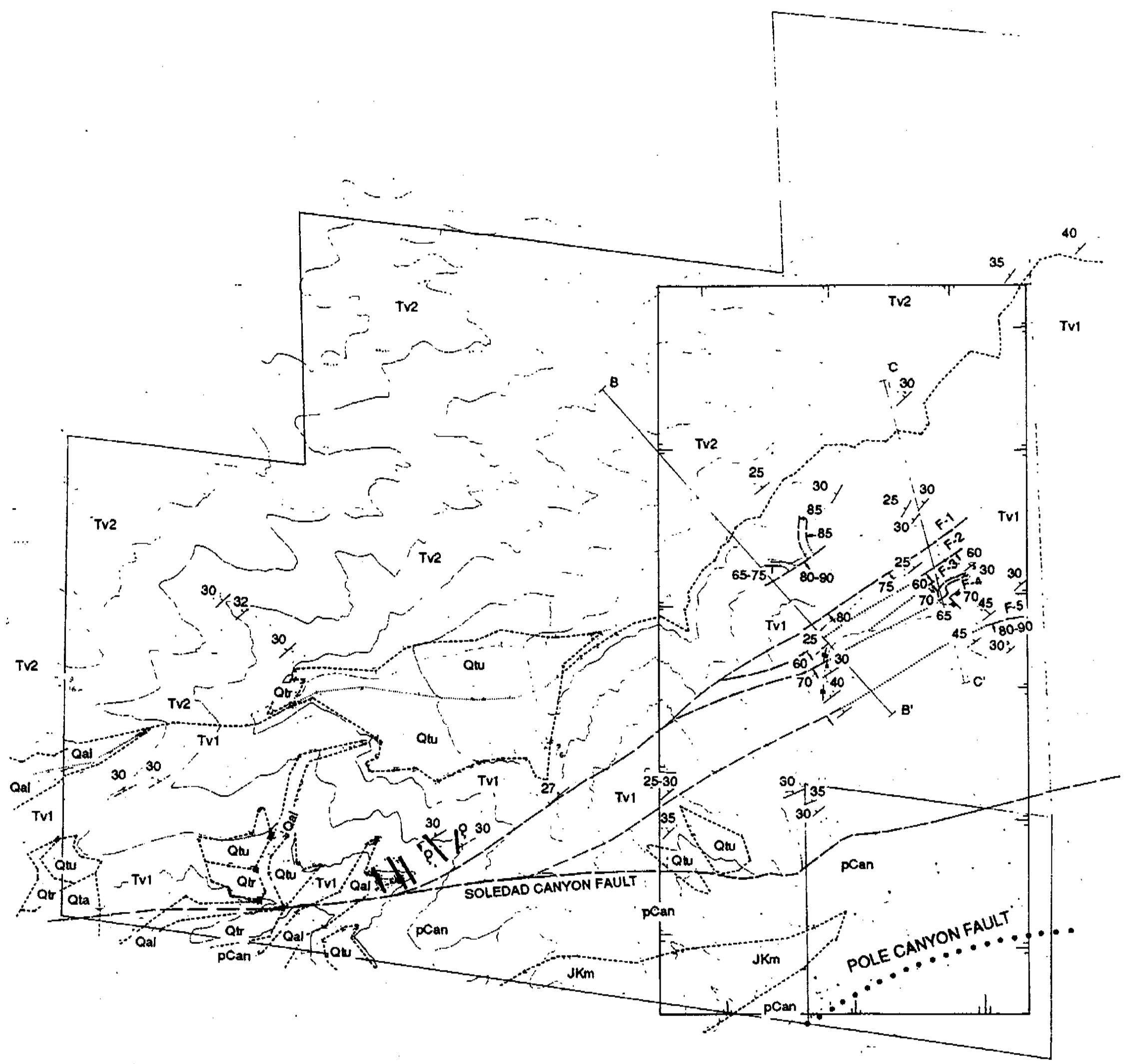
The Agua Dulce, Soledad, and Pole Canyon Faults are considered to be inactive and do not represent a significant seismic hazard to Project construction and operations (Ziony and Jones 1989; except Pole Canyon). An inactive fault was encountered onsite by STE (1991) during a geological field investigation of an existing pit on the eastern side of the property. The fault was believed to be a branch or possibly the main trace of the Soledad Fault. The general lithology and faults of the Project site are shown on Figure 3.1.1-4, and Plate 2 of the STE report provides a more extensive geologic map based on the findings of the pit investigation.

No known active faults have been mapped in the Project area, and the site is not within an Earthquake Fault Zone (formally known as Alquist-Priolo Special Study Zone) as defined by the Alquist-Priolo Earthquake Fault Zoning Act. The closest active fault to the Project site is the San Gabriel Fault; however, the San Andreas Fault (the second closest) is capable of causing a larger-magnitude earthquake and has the same relative degree of expectancy (Hilltop 1992). Therefore, the San Andreas Fault represents the greatest potential for seismic hazards at this site



Source: CDMG, 1987a

AGGREGATE RESOURCE SECTORS
Figure 3.1.1-3



- Lithologic contact
- Concealed lithologic contact
80-90 F-5 - Fault line and attitude
30 - Bedding attitudes
70 - Joint attitudes
- Small faults
- Concealed fault
C C' - Section line
- Spring

Qal - Alluvium
Qtr - River terrace
Qta - Alluvial terrace
Qtu - Undifferentiated terrace
Tv2 - Middle unit, Vasquez Conglomerate
Tv1 - Lower unit, Vasquez Conglomerate
JKm - Muscovite monzonite
pCan - Anorthosite

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Source: STE Associates, Inc. 1991

SITE LITHOLOGY AND FAULTS
Figure 3.1.1-4

within the next 50 years. An examination of existing cut slopes onsite was made by TMC geologists after the 6.7 magnitude Northridge earthquake. No detrimental effects were observed on the cut slopes in spite of the strong shaking from that quake.

Updated fault parameter information was obtained from Open File Report 96-08 published by the CDMG. This report was co-authored with the U.S. Geological Survey (USGS) (Open File Report 96-706) for the primary purpose of assessing seismic hazards in the State of California. Information published in this report is intended to be used by engineers, geologists, and public policymakers for the purpose mitigating the effects of seismic hazards in structural design and land use planning. Based on the fault information presented in this report, the Mojave segment of the San Andreas Fault is the closest and most applicable segment of the San Andreas Fault that would affect the Soledad Canyon site.

To evaluate the seismicity of the Soledad Canyon site, data pertinent to the site were applied to the Campbell and Bozorgnia (1994) ground acceleration attenuation graphs. Because the Soledad Canyon site is underlain by hard, crystalline and sedimentary rock, only the peak acceleration and site amplification factors were used to predict peak ground acceleration; alluvium and soft bedrock attenuation rates are not applicable at this site. Table 3.1.1-1 lists the seismicity of the Soledad Canyon site using the 1994 attenuation graphs (Campbell and Bozorgnia 1994).

Based on a maximum probable earthquake of 7.1 M along the Mojave segment of the San Andreas Fault zone, a maximum probable peak horizontal bedrock acceleration of 0.21 g could be expected. Repeatable accelerations are generally 65 percent of the maximum probable acceleration; thus, an acceleration of 0.14 g could be expected as the maximum repeatable acceleration from the San Andreas Fault.

Hazardous Materials

A previous site assessment by Chambers Group (1990) involved limited soil and water testing in areas of previous mining disturbance. Soil samples were collected by Chambers Group in the area of the settling ponds and from the silts deposited on Parcel A by previous aggregate washing.

Minor concentrations of oil and grease were noted in three samples: two from the settling pond silts and one from the silt depository on Parcel B. Chambers Group concluded that no significant environmental concerns were identified.

Two subsequent environmental site assessments have been conducted for the Project site (West Coast Environmental 1997c, 1997d). A Preliminary Environmental Site Assessment was completed documenting the results of a historical records search and interviews with regulatory agency officials and individuals associated with the site. It also included a site reconnaissance conducted in March 1997 to investigate any hazardous materials storage and any existing signs of contamination. The former aggregate washing plant, truck scales, and associated structures on Parcel A were not included in the inspection due to litigation with the surface estate owner. Due to the topography of the site, the site inspection focused primarily on the former mining area on Parcel A. The majority of Parcel B was included in the inspection.

Table 3.1.1-1

SEISMIC CRITERIA

Predicted Ground Accelerations Based on Fault Type, Distance, Magnitude, and Rock Type Underlying Site*					
Fault Name	**Fault Type**	**Nearest Seismogenic Distance (miles)**	**Maximum Magnitude**	**Peak Ground Acceleration (g)**	**Maximum Repeatable Acceleration (g)**
Holser	Strike slip	12	6.5	0.15	0.10
Northridge Hills	Thrust	16	6.9	0.15	0.10
Oak Ridge	Blind thrust	20	6.9	0.12	0.08
San Andreas	Strike slip	12.4	7.1	0.21	0.14
San Cayetano	Thrust	26	6.8	0.08	0.05
San Gabriel	Strike slip	7	7.0	0.31	0.20
San Jacinto	Strike slip	24	6.7	0.08	0.05
Santa Susana	Thrust	13	6.6	0.21	0.11
Sierra Madre	Thrust	12	7.0	0.21	0.14
Simi	Thrust	22	6.7	0.10	0.06
*** Based on Campbell and Bozorgnia 1994**					

Since approximately 1991, the surface estate owner has stockpiled debris and refuse material including gravel, asphalt, and rock. The amount of material was estimated at 44,000 cubic yards. The purpose of the Preliminary Environmental Site Assessment was to identify potential environmental liabilities associated with the site and in particular those due to the presence of the debris and refuse. The report concluded that the debris/refuse posed a potential environmental risk and recommended that all debris be removed prior to completing the second assessment.

The Preliminary Environmental Site Assessment was supplemented by a second environmental assessment report. The site reconnaissance for the second assessment was conducted in July 1997 to determine whether the soil at the site contains metals, petroleum hydrocarbons, or solvents as a result of previous operations at the site and collect samples for asbestos analysis.

The results of the 1997 Preliminary Environmental Site Assessment and laboratory testing revealed the following:

- Mixed in with the debris and refuse stockpiles were other waste materials including wood, metal pipe, plastics, household trash bags, and similar items. The largest debris pile was located along the northern portion of the assessment area and was elongated east to west with an estimated volume of approximately 44,000 cubic yards. The major components of the pile were concrete and asphalt. A brick pile was located in the northwestern portion of the assessment area and trended northwest-southeast. This pile primarily contained fired clay brick and had an estimated volume of approximately 6,000 cubic yards. As of the July site reconnaissance, all of the debris had been removed. No hydrocarbons, polychlorinated biphenyls (PCBs), or asbestos were detected in samples collected below either of the piles. No concerns were noted with respect to metals analyses.

- A portable processing plant was used to crush the debris and refuse into useable materials. Included in the recycling operation were two aboveground storage tanks (ASTs) of several hundred gallon capacity and a construction trailer present in the vicinity of the portable plant. The contents of the trailer and the tanks were not mentioned. As of the July site reconnaissance, the portable processing plant and tanks had been removed. No hydrocarbons or asbestos were detected in samples collected from the test pit near the former location of the portable processing plant.

- Materials processed through the portable plant were stockpiled immediately to the south, where a vertical relief of approximately 25 feet exists. As of the July reconnaissance, the majority of the processed material was removed. No hydrocarbons or asbestos were detected in samples collected from the test pit near the former location of the processed debris pile.

- Two 55-gallon drums were abandoned in an area to the south and east of the portable processing plant. The contents of the drums are unknown, and at least one appeared to be leaking. Other debris, such as an inoperable concrete mixer, was also noted in this area.

In the area of the 55-gallon drums, hydrocarbons were detected in the samples collected from the test pit where the drums were abandoned. The surface stain beneath the drum had a total extractable petroleum hydrocarbons (TEPH) concentration of 14,000 milligrams per kilogram (mg/kg). The TEPH concentration at a depth of 1 foot bgs was 2,000 mg/kg. The carbon range of the hydrocarbons detected in this area was C23+, which is consistent with motor oil. The vertical extent of the contamination was not determined due to the limitations of the assessment methodology.

Metals concentrations in the test pit surface sample were elevated slightly above background levels but did not exceed the California Code of Regulations Title 22 (22 CCR) Total Threshold Limit Concentration or 10 times the 22 CCR Soluble Threshold Limit Concentration. No PCBs or asbestos were detected in samples collected from the abandoned drum area.

- Diesel fuel, hydraulic oils, waste oil, and similar hazardous materials were stored in AST's and underground storage tanks (USTs) at the aggregate plant by Curtis Sand and Gravel. Petroleum hydrocarbons in the carbon range C13 to C22, which is consistent with diesel fuel, were detected in the sample collected from a surface stain near the former location of the tanks. The stain was small and did not appear to extend below the surficial soils. No asbestos or PCBs were detected.

- A septic tank and leach field system is associated with the Curtis Sand and Gravel aggregate plant and truck scale office. This system may still be active and may have received waste other than sanitary waste from toilets and sinks.

The nearby surrounding properties were surveyed for obvious signs of contamination, tanks, drums, hazardous material storage facilities, and related concerns. No sources of possible contamination were identified.

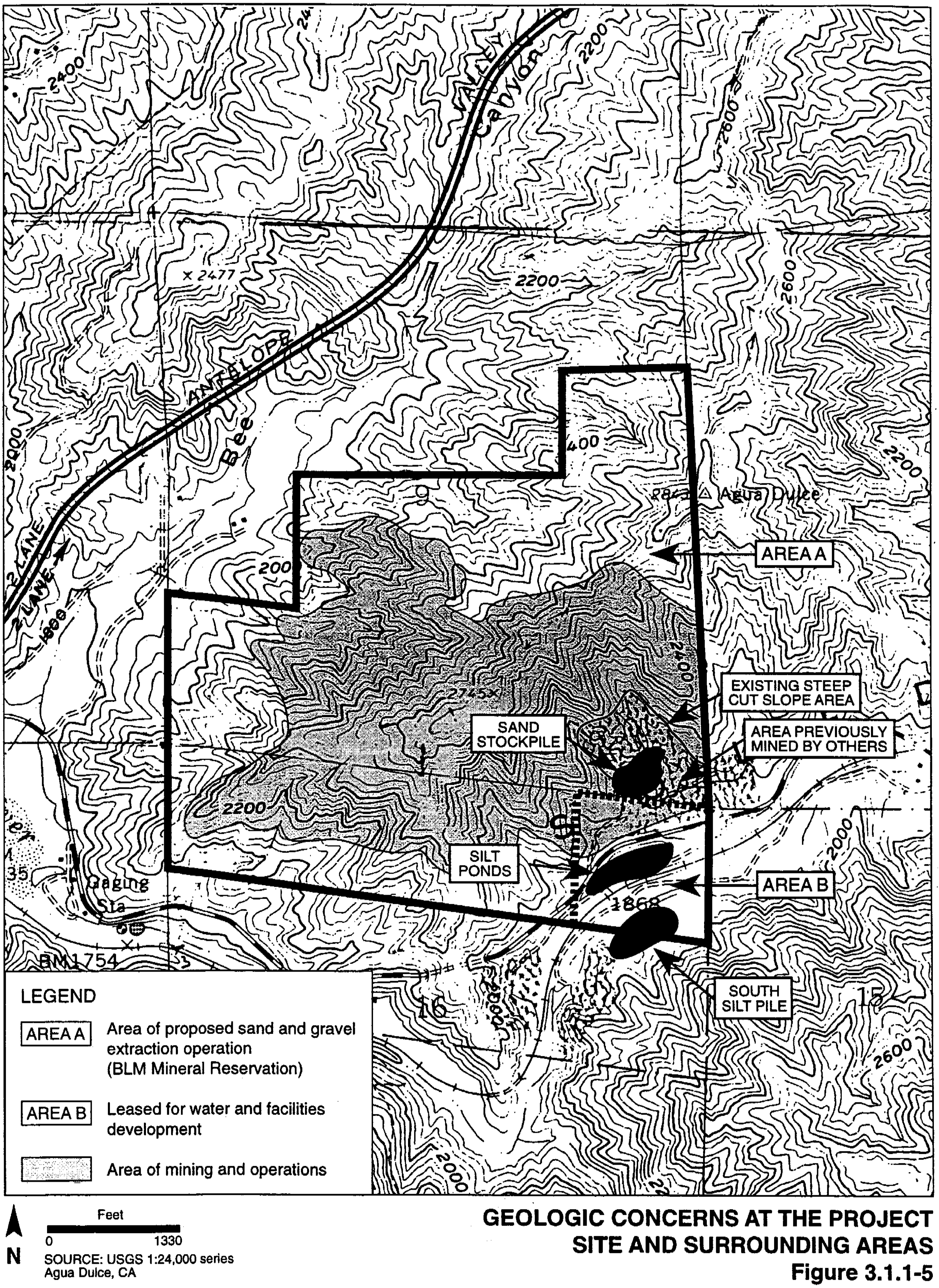
A site reconnaissance of the former aggregate washing plant, truck scales, and associated structures on Parcel A was completed on January 26, 1998. The report identified minor quantities of hazardous materials (5 gallon pails) and three transformers that could potentially contain PCB's.

Physical Hazards

Geologic hazards are geological conditions or phenomena that present a risk or are a potential danger to life or property. They can be either naturally occurring or man-induced and include areas such as fault rupture zones and/or formations that have a potential for liquefaction, creep, or failure. Four potentially hazardous areas associated with the previous rock and gravel processing operations occur at the Project site.

Abandoned Silt Ponds: The first area is adjacent to the abandoned siltation ponds located south of Soledad Canyon Road (Figure 3.1.1-5). The ponds were previously filled by a rock and gravel process washwater pipeline from the adjacent Canyon Country Enterprises Mining property. The south perimeter of the ponds is diked by a service road that is north of and parallel to the railroad right-of-way. This area is actually not hazardous in its existing condition. It could be hazardous if something were to be built on the area.

Existing South Silt Pile: The second area is a silt pile located on the south side of the Santa Clara River in a gently sloping area at the base of the San Gabriel Mountains (Figure 3.1.1-5). Prior to C.A. Rasmussen Co. purchasing this property, approximately 275,000 cubic yards of partially dewatered silt from the aforementioned siltation ponds were excavated and placed on the south side of the river. The entire fill area measures approximately 450 feet wide (east to west) by 400 feet long and 50 feet deep. This fill was not engineered or compacted to a predetermined specification. The silt pile apexes southward into a ravine that collects runoff from the adjacent hills. The runoff percolates through the silt above the original ground surface and seeps out of the toe of the silt bed. This action is evidenced by silt fans extending toward the river. Because the silt pile will not be affected by TMC's Project and it is the responsibility of other parties, it will not be discussed further in this EIS.



SOURCE: USGS 1:24,000 series
Agua Dulce, CA

GEOLOGIC CONCERNS AT THE PROJECT SITE AND SURROUNDING AREAS

Figure 3.1.1-5

However, it is noted that the landowner and previous mining operator are developing a solution to the problem.

Steep Cut Slope Area: Because steep cut slopes can be prone to failure, they present a hazard to equipment and personnel above and below them. Slope failure may be induced by surcharge, vibration, or seismic motion. Hilltop (1997a, 1997b) performed a slope stability analysis for stabilizing this area and the planned mining cuts throughout the Project site. Computer-aided analysis using the PCSTABL5 program developed by Purdue University was used to calculate factors of safety for static and pseudostatic (seismic) conditions.

Sand Stockpile Area: This fill sand stockpile lies east of a north-south-trending ravine directly below the area that was previously mined. A portion of the stockpile in the ravine was washed out in March 1992 by surface runoff from the existing mined area and surrounding steep slopes. The runoff discharged down the service road toward Soledad Canyon Road, but siltation of Soledad Canyon Road was avoided by diverting the flow into a culvert that drains into the siltation ponds.

3.1.1.2 Environmental Effects

Significance Criteria

Potential geological impacts are considered significant if any of the following events occur:

- the geological hazard may cause personal injury or loss of life;
- there is a potential for ground movement that could be detrimental to proposed or existing structures, public works, utilities, and/or natural or manufactured slopes;
- secondary effects of seismically induced ground motion (i.e., liquefaction, settlement, translation, seiche, tsunami, slope failure) could result in damage to or degradation of proposed site improvements; and/or
- the Project will create a geological condition or exacerbate an existing condition that will have a potential to create structural damage or cause personal injury or loss of life onsite or offsite.

An impact is considered beneficial if it improves any of the conditions mentioned above.

Direct and Indirect Effects

The principal geological hazards and constraints to the Project are described in this section. This analysis is based on geotechnical studies specific to the site, review of available published geological data, and site reconnaissance.

Faulting, Surface Rupture, and Seismicity Potential

Because no potentially active or active faults are present in the site vicinity, very little potential exists for surface rupture; therefore, no significant adverse seismic impacts are anticipated.

Liquefaction Potential

Liquefaction is the process by which water-saturated sediments lose strength and fail during strong shaking from an earthquake or mechanical means. The types of ground failure associated with liquefaction include lateral spreading, flow failure, ground settlement, and loss of bearing strength. Areas of the site that are prone to liquefaction include the sand stockpile, silt ponds, and Santa Clara River bottom. Because the fill sand stockpile will be removed or compacted during grading for Phase 1 facility improvements, no impacts will be associated with it. The silt ponds in Area B are diked by a compacted road berm that will prevent spreading or flow of material into the Santa Clara River in the event of a strong ground motion or vibration. No Project improvements are planned for the silt ponds, and no structures will be built on them; therefore, no associated liquefaction impacts are anticipated.

Compressible/Collapsible Soil Potential

The potential for compressible/collapsible material is very unlikely within the Vasquez Formation but may be associated with both recent stream deposits and artificial fills. The Curtis Sand and Gravel mining operation used the siltation ponds under a Los Angeles County (County) Conditional Use Permit (CUP) that ruled out other types of uses (i.e., structures, roads) which could possibly be affected by settlement. Therefore, no significant adverse impacts are anticipated.

Expansive and Corrosive Soil Potential

With the exception of the silt ponds and the overbank areas of the Santa Clara River, a very low likelihood exists for expansive and/or corrosive soils on the Project site. Expansive soils result from clay in the fines. As was mentioned previously, the siltation ponds were operated under a County CUP that ruled out other types of uses (i.e., structures, roads) which could possibly be affected by expansive soil. The overbank areas of the river will not be used for construction purposes. Therefore, no significant adverse impacts related to expansive or corrosive soils are anticipated.

Slope Stability Potential

Slope stability analyses were performed to evaluate the potential for impacts related to slope instability in the Project's NFSA, batch plant area, mining cuts, and the existing gravel pit. Stability under static and pseudostatic (seismic) conditions was evaluated using computer-assisted analysis to calculate factors of safety against failure. The analyses involved modeling to replicate parameters such as soil strength and slope angles in the areas being evaluated and using a horizontal acceleration (g) factor to simulate a seismic event.

The slope stability analyses performed resulted in determinations of numeric "safety factors" for each of the modeled slope conditions. A minimum pseudostatic safety factor of 1.1 and a minimum static safety factor of 1.5 are considered acceptable by the County Department of Public Works (DPW). Surficial slope stability evaluations were also performed assuming that the outer 4 feet of the material was saturated. Surficial slope stability analysis indicates that the proposed cut slopes have a factor of safety of 1.5 or greater. Surficial slope stability analysis of the fill material indicated a factor of safety of less than 1.5. Mitigation measures as presented in Mitigation Measure G2 will provide a factor of safety of 1.5 or greater for the fill material.

Relative to mine safety and procedures, the Project incorporates regular monitoring and reporting of fill operations and requires compliance with all Los Angeles County specifications contained in the zoning code relative to surface mining (see Mitigation Measures G6 and G7).

<u>North Fines Storage Area</u>

The proposed placement and compaction of fines in the NFSA were evaluated for slope stability by Environmental Solutions, Inc. (ESI 1991) using direct shear tests and a seismic coefficient of 0.15 g. Hilltop performed a supplemental analysis of the area (Hilltop 1995a, 1995b) using a higher coefficient that was based on seismic data derived from the 1994 Northridge earthquake. Both analyses modeled conditions based on assumptions of 75-percent compaction of fill material and slope angles of 2:1 (horizontal to vertical). Hilltop (1996 and 1997c) modified the slope analysis to comply with design criteria specified by the County.

The County has indicated that minimum safety factors of 1.5 and 1.1 would be required for all static and pseudostatic slope stability evaluations, respectively. A review of the stability evaluations contained in Hilltop (1995b) indicates that the static factor of safety against deep-seated slope failure was 1.9, while the factor of safety against shallow failure was 1.4. Because the safety factors obtained for deep-seated slope stability were greater than the required 1.5, only shallow slope or surficial stability would need to be improved to 1.5.

Hilltop's (1996 and 1997c) evaluations determined the degree of compaction required to achieve a 1.5 factor of safety. Based on this analysis, the factor of safety can be achieved and slope stability impacts can be avoided by compacting the outer 30 feet of the fill material on the slope to 80 percent relative compaction. The remainder of the fill within the proposed slope would be compacted to 75 percent relative compaction, as previously proposed. Additionally, surficial slope stability mitigation measures along with compaction requirements have been incorporated with Project design (see Mitigation Measure G1). Therefore, no significant impacts on slope stability in the NFSA are anticipated.

<u>Other Fines Storage</u>

Fines produced during mining will also be backfilled into the mining cuts. The fills in Cuts 1 and 2 will be minor fills, however, the Cut 3 fill will be subject to factor of safety design parameters. Slope stability analyses (Hilltop 1997a, 1997b, 1997c) indicate that acceptable static and pseudostatic factors of safety can be achieved in Cut 3 with 75 percent relative compaction of the fill and benches at 90-foot vertical intervals. This exceeds the required 1.5 factor of safety. Additionally, surficial slope stability measures have been incorporated into the Project design (see Mitigation Measure G2); therefore, no significant impacts on slope stability in the Cut 3 fill area are anticipated.

Surficial Slope Stability for Proposed Fill Slopes

A surficial slope stability evaluation on propsed fill slopes of the aggregate mining area final reclaimed contour configurations was performed (Hilltop 1997b). The surficial stability calculations were performed assuming a 4-foot depth of saturation perpendicular to the face of the slope, and previous geotechnical parameters were used for the initial gross slope stability evaluations under static and pseudo-static slope conditions.

Based on the results of the analyses performed, it is recommended that the outer 10 feet of the proposed fill slopes be constructed with a soil material having minimum strength characteristics of cohesion equal to 175 pounds per square foot (psf) and angle of internal friction equal to 35 degrees or some other alternative soil strength combination that will result in the minimum factor of safety of 1.5 (see Mitigation Measure G6). It is anticipated that more cohesive material will be readily available as a waste product during manufacturing of the aggregate. It is expected that this material can be blended to generate soils with suitable strength characteristics.

Former Gravel Pit

Recommendations have been made for stabilizing the near-vertical walls of the existing 40-acre pit (STE 1991). Static and pseudostatic analyses of the pit slope stability were performed using the PCSTABL5 computer program to calculate factors of safety against failure. A 0.15-g horizontal acceleration was used to simulate a seismic event. Initially, the bottom of the pit walls on the west, north, and northeast sides will be buttressed with fill. To avoid slope stability impacts, the mined cut slopes will be laid back to overall inclinations of 1.15 horizontal to 1 vertical (1.15:1) using 15-foot-wide benches at 100-foot vertical intervals (see Mitigation Measure G3). With proposed slope stability measures, no significant adverse impacts with regard to slope stability are anticipated. To the contrary, a beneficial impact will result because an existing physical hazard will be alleviated.

Batch Plant Area Slopes

Slope stability of the highest proposed cut slope (160 feet) in the future batch plant area has been evaluated. The 1:1 slope of the exposed conglomerate and anorthosite would achieve the minimum required safety factor of 1.5 and 1.1 for static and pseudostatic conditions, respectively; therefore, no significant slope stability impacts are anticipated.

Proposed Mining Cuts

Hilltop conducted a preliminary slope stability analysis to determine reasonable bench widths and vertical spacings to be used during the mining operation to achieve acceptable slope stability (Hilltop 1993b). The overall interim pit slopes are anticipated to be approximately 1:1 (horizontal to vertical. Benches will be excavated at regular intervals within this overall temporary slope inclination and will serve as access roads during the lifetime of the operation. Upon completion of the mining operation, the excavated slopes will be laid back to approximately 1.15:1 (horizontal to vertical), and the face of the slopes will be recontoured with 4-foot vertical faces and 4-foot benches. This will be accomplished by constructing 15-foot-wide benches at approximately 100-foot vertical intervals within the overall slope face.

Stability analyses were conducted using the soil strength parameters previously developed by STE (STE 1991) for gross stability evaluations and a seismic coefficient of 0.15 g. In 1995, Hilltop performed an analysis of the area using a higher coefficient (0.26 g) that was based on seismic data derived from the 1994 Northridge earthquake (Hilltop 1995a, 1995b). Subsequently, Hilltop performed a supplemental slope stability evaluation to augment the prior general stability analysis and evaluate the final slope configurations planned at the completion of the aggregate mining operation in order to comply with the County DPW directives regarding factors of safety (Hilltop 1997a). This included pseudostatic slope evaluations using fault magnitude information obtained from the "California Fault Parameter" data obtained from the newly adopted report by the CDMG and USGS entitled "Probabilistic Seismic Hazard Assessment for the State of California" (CDMG 1996).

The County DPW and generally accepted geotechnical industry standards for minimum factors of safety for all permanent cut or fill slopes are 1.5 and 1.1 for static and pseudostatic loading conditions, respectively. Suitable factors of safety were found to occur for all portions of the site under both static and seismic loading based on geotechnical industry-accepted standards except for the northeast and the south central portions of the mining area.

In order to increase the factors of safety to acceptable levels, slope stability analyses were performed to evaluate the maximum slope heights and inclinations for both static and pseudostatic conditions for final design of all critical slopes in the mining plan. The originally proposed cut slopes will be modified based on the maximum vertical slope height for various inclinations until minimum factors of safety for static and pseudostatic conditions are met.

For cut slopes at the northeast portion of the mining area, stability will be improved by flattening the overall inclinations of the slopes from 1.15:1 to 1.25:1 (horizonal to vertical). For cut slopes at the far northeast portion of the mining area, stability will be improved by flattening the overall inclinations of the slopes from 1.15:1 to 1.30:1. These inclinations (see Mitigation Measure G4) will achieve the acceptable factors of safety. These suitable safety factors could also be obtained by increasing the widths of the terraces within the slopes or using flatter slope inclinations and maintaining the current terrace widths.

During mining, based on the results of the analyses, acceptable stability will be achieved along the working face by constructing 35-foot-wide benches with maximum vertical spacings of 35 feet in the undisturbed native materials. In addition, the minimum horizontal setback for heavy equipment on the cut benches should be 15 feet, measured from the outer edge of the undisturbed native material.

The stability analyses also evaluated the effects of water infiltration on the final recontoured bench configuration and determined that slope stability would be virtually unchanged by saturation of near-surface cut materials. Although moderate amounts of material sloughing from the 4-foot benches may occur during heavy rainstorms, such sloughing is expected to be minor and will not affect the overall stability of the slopes. In consideration of potential adverse effects of equipment vibration on slope stability during the mining operation (e.g., localized popouts, raveling, and rockfalls), Hilltop (1993a, 1993b) recommends that the rock crusher unit be frequently moved, which is normal during mining operations.

Based on the slope stability analyses, the proposed mining operation can be engineered to avoid significant impacts related to slope stability.

Sand Stockpile

Because the fill sand stockpile will be removed or compacted for construction of the processing/batch plant, erosion of material from the stockpile onto Soledad Canyon Road will cease, resulting in a beneficial impact.

Hazardous Materials Conditions

Results of the Preliminary Environmental Site Assessment and soils testing conducted by West Coast Environmental (1997a, 1997b) indicate the potential for hazardous materials or hazardous wastes to be associated with the site, resulting in an adverse but not significant impact. Known areas of contaminated soils will be removed and properly disposed of at a Class I hazardous waste facility. All known areas of suspected contamination, such as the area near the abandoned drums and other areas encountered during project operations and deemed suspect of contamination, will be tested and materials disposed of in a manner consistent with pertinent regulations.

3.1.1.3 Mitigation Measures

The following Project designs and specifications are summarized here as mitigation measures for potential slope stability impacts:

G1. Slope stability in the NFSA will be obtained by constructing 2:1 (horizontal to vertical) slopes at 75 percent relative compaction and compacting the outer 30 feet of material on the slope to 80 percent relative compaction. To mitigate the potential for surficial instability, the outer 10 feet of the proposed fill slopes will be constructed with a soil material having minimum strength characteristics of cohesion equal to 175 psf and angle of internal friction equal to 35 degrees or some other alternative soil strength combination that will result in the minimum factor of safety of 1.5.

G2. Fill slope stability in the Cut 3 fill area will be obtained by constructing 2:1 (horizontal to vertical) slopes and achieving 75 percent relative compaction. Benches will be constructed at 15-foot-wide and 90-foot vertical intervals. To mitigate the potential for surficial instability, the outer 10 feet of the proposed fill slopes will be constructed with a soil material having minimum strength characteristics of cohesion equal to 175 psf and angle of internal friction equal to 35 degrees or some other alternative soil strength combination that will result in the minimum factor of safety of 1.5.

G3. Ultimately, the former gravel pit high walls will be altered to a 1.15:1 (horizontal to vertical) slope using 15-foot-wide benches at 100-foot vertical intervals. The bottom of the pit walls on the west, north, and northeast sides will be buttressed with fill to provide a buffer zone and increase slope stability.

G4. To achieve suitable factors of safety for cut slopes, the following mitigation is presented. For cut slopes at the northeast portion of the mining area, overall inclinations of the slopes will be flattened from 1.15:1 to 1.25:1 (horizontal to vertical). For cut slopes at the far northeast portion of the mining area, the overall inclinations of the slopes will be flattened from 1.15:1 to 1.30:1 (horizontal to vertical).

G5. Interim mining cuts will be constructed using 35-foot-wide benches over 35-foot elevational changes during removal of the native material while controlling surface runoff and erosion.

In addition to the above measures, the following standard conditions of approval will be incorporated to ensure that there will be no significant geotechnical impacts:

G6. The mining activity will be regularly monitored throughout the life of the Project by a California registered civil engineer or engineering geologist, and periodic testing of the fill materials will be performed to verify strength parameters of the fill soil and relative compaction. The mine operator will maintain all records of correspondence, reports, and designs provided by the registered professional.

G7. Proposed mining and reclamation specifications and procedures will be in accordance with the County of Los Angeles Planning and Zoning Code, Title 22, Part 9, Chapter 22.56, Surface Mining Permits.

3.1.1.4 Unavoidable Significant Adverse Effects

The measures proposed above can be feasibly implemented and will reduce the identified impacts to a less-than-significant level. No potential significant unavoidable adverse impacts will remain after mitigation.